Growing

CELERY

in hawaii

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Yukio Nakagawa

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About the Author

Mr. Nakagawa is an Assistant Specialist in Horticulture with the Extension Service. He has been a staff member of the University since 1941, with the exception of the 1951–53 years when he was with a private firm. He has prepared this leaflet as part of a series for the farmers of Hawaii.

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GROWING CELERY IN HAWAII

Foreword

The commercial production of celery in Hawaii has steadily increased since 1952 when 500,000 pounds were produced. A million six hundred thousand pounds were grown in 1954. The average annual imports during this period were 2,000,000 pounds.

The increase in production was made possible primarily through the work of a few progressive farmers who solved, through several costly trial plantings, numerous production problems. This was done by adopting the latest celery varieties for propagation, and by putting to use cultural methods best suited for the crop.

The chief obstacle to island-grown celery in the past has been the consumer's resistance to it because of the dark green color and strong flavor. Today, properly grown island celery cannot be differentiated from mainland celery either by color or flavor.

Varieties

The principal varieties grown in Hawaii are the Utah Special and Emerson Pascal. The Utah strains have a flatter petiole than the Pascal strains and can be held in the field a little longer without serious hollowness developing in the outer petioles. The Pascal strains have round petioles of excellent quality. They cannot be held too long in the field, however, because of serious losses from hollowness in the outer petioles. The Emerson Pascal variety is recommended because of its resistance to Early Blight.

Climatic Requirements

Celery is very sensitive to both low and very high temperatures. A temperature range of 65°F–75°F. is best suited for the crop. Exposure to temperatures below 65°F. for two weeks or more may cause bolting or seed stalk formation. Exposure to temperatures above 80°F., especially toward maturity, may cause serious losses from tip burning, heart rot, and dark green stalks with strong flavor under high nitrogen applications.

Soil Requirements

Celery requires a well-drained soil amply supplied with organic matter, and which has a good water-holding capacity (pH 6.0–7.0). On light sandy soils, large amounts of organic matter should be plowed in to improve the fertility and water-holding capacity of the soil.

Soil Preparation And Treatment

The soil should be plowed to a depth of 8–10 inches and harrowed or disked. If manure is available, 10–15 tons per acre should be plowed in. If the field must be treated for rootknot nematodes, 10–15 gallons of EDB (20%) or 250–400 pounds of DD should be applied after disking and the field left for 2–3 weeks before planting. If lime must be applied to correct the pH, it should be applied first and plowed into the soil at least 3–4 weeks before planting.

Seedling Bed Preparation And Maintenance

The celery seeds are planted in seedling beds and the seedlings are transplanted to the field. The period from seed to transplanting stage runs from about 50 to 70 days. One-fourth to one-half pound of seeds will produce enough seedlings to plant an acre. One ounce of seeds will produce about 8,000 plants.

The soil in the seedling bed should be thoroughly prepared. It should be well-pulverized, and fumigated with a methyl bromide—chloropicrin mixture (MC-2) to eliminate weed seeds, the damping-off organisms, and nematodes. Apply MC-2 at the rate of one pound per 100 square feet.

Vapam (sodium N-methyl dithiocarbamate—31%) applied as a soil drench at the rate of 1½ pints to 1½ quarts in sufficient water per 100 square feet of area is reported to control nematodes, weed seeds, and certain soil-borne fungus diseases. A waiting period of 2–3 weeks is necessary after treatment.

Treat the seed with Semesan or cuprocide using ½ level teaspoonful of disinfectant to each pound of seed before planting.

Broadcast the seeds and either rake them lightly into the soil or cover them with burlap bags until they sprout. Celery seeds usually require 5–14 days to germinate. Soaking the seeds in water before planting will aid in hastening the germination.

The seedling bed should be watered regularly with a sprinkling can or hose with a nozzle attachment. In hot areas the use of shade, either natural or artificial, may be necessary during the very early stages of seedling growth.

If fertilizer was not mixed with the seed bed soil, the seedlings should be watered once a week with a fertilizer solution mixed at the rate of one teaspoonful of a water soluble complete fertilizer dissolved in one gallon of water. If fertilizer is to be mixed in the seed bed soil about a pound of a complete fertilizer, such as 5-10-10 should be broadcast over 100 square feet and raked into the soil.

To prevent damping-off, blight diseases, and insect damage, the seedlings should be sprayed with a Malathion-Zineb, or Maneb spray once a week. If weeds appear, spray the seedling bed with Stoddard Solvent or any thinner when the weeds are just appearing but after the seedlings show two or more true leaves.

Field Planting And Spacing

The seedlings are transplanted to the field when they are about 4–6 inches high with 4–6 leaves. With furrow irrigation, the plants are set in two rows on the opposite sides of the furrow banks at the water line. The furrows are usually 8–10 inches wide and spaced 15–18 inches apart. With sprinkler irrigation, the plants are set in rows of four spaced 8–10 inches apart with 18–24 inches between each set of four rows. With the sunken bed method of flood irrigation, the row spacing is similar to that of sprinkler irrigation, the only difference being in the four rows planted in sunken beds 3–4 inches deep. The spacing between plants is usually between 8–10 inches in the rows. If smaller-sized plants are preferred, the spacing between plants should be reduced to 4–6 inches.

Irrigation

Celery requires a constant and fairly high soil moisture from planting to maturity. The crop will not make satisfactory growth on waterlogged soils or under excessive rainfall or irrigation. The crop should not be allowed to wilt from lack of moisture, although the surface of the soil should be relatively dry to allow for weed cultivation. After the crop reaches maturity, care should be taken to keep water out of the hearts of the plants; otherwise, tip burning and various forms of rots may cause severe losses.

Fertilizer Applications

A fertilizer formula with an N, P_2O_5 and K_2O ratio of 5-10-10 applied at the rate of 3,000 to 4,000 pounds per acre in 3–4 applications seems best suited under most soil conditions. Fertilizers containing high amounts of nitrogen

usually produce dark green, strong flavored plants and tip burning under warm temperature conditions.

The first application of fertilizer at 1,000 pounds per acre is made just after transplanting in two bands, each located 2–3 inches deep and 3–4 inches to the side of the plants. Two or three additional applications at 1,000 pounds per acre are made four weeks apart. They are either top dressed or drilled to a depth of 3–4 inches in two bands, each located 4–5 inches from the plants.

If the crop is grown on very acid soils, the application of 200 pounds per acre of sodium nitrate or sodium chloride is recommended to satisfy the sodium requirement of the crop.

In many areas where the soil is low in boron, foliar sprays containing two pounds of Borax in 100 gallons of water must be applied once or twice during the early to mid-stages of the crop's growth to prevent cracking and malformation of the stems.

Weed Control

The celery crop in the early transplanted stage may be weeded through the use of sprays, such as Stoddard Solvent or thinners. For weed sprays to be effective, the weeds must be in the very young stage just after emergence. Oil weed sprays should not be used after the transplants attain a height of six inches or more. Weeding after this stage must be done mechanically. Shallow cultivation is necessary for the crop since much of the root-system of celery is near the soil surface. Two to three weedings are usually necessary for a crop.

Insect Control

The insects most commonly found attacking celery are cutworms, aphids, red spider mites, garden loopers, and armyworms.

The cutworms may be controlled by spraying the basal portion of the seedlings and the soil around them with Toxaphene mixed at the rate of 4 pounds 40 percent Toxaphene in 100 gallons of water. The aphids can be controlled by Malathion sprays. The garden loopers and armyworms are best controlled by DDT sprays.

A combination Malathion-DDT spray will give good control of the insects. To control the aphids, the spray should be applied in such a manner and force as to wet the under surfaces of the leaves.

Red spider mites are best controlled by sulfur sprays or dusts.

Slugs and snails may become troublesome in areas surrounded by dense growth of succulent weeds. To control slugs and snails, the area around the fields should be sprayed with metaldehyde mixing 8 pounds of 50 percent wettable metaldehyde in 50 gallons of water. This spray should not be used on plants because of possible injury to them. If the pests are found in the field, scatter metaldehyde-arsenic bait between the plants in the infested area, avoiding contact with the plants during late afternoon. Snail and slug baits containing metaldehyde are available commercially. If a home-mixed bait is preferred, mix 10 ounces of 50 percent metaldehyde and 20 ounces of calcium arsenate with 20 pounds of wheat bran or corn meal. Add enough water to moisten the mixture.

Disease Control

The diseases most commonly found on celery are: Early and Late blights, pink rot *(Sclerotinia)*, black heart, rootknot nematode, bacterial soft rot, and mosaic.

Early blight is best controlled by using the resistant Emerson Pascal variety. Zineb, Captan and Maneb sprays have given good control of the blights.

Black Heart Disease. Don't let this happen to your celery!

Pink rot is best controlled by soil treatment with calcium cyanamide applied at the rate of 800–1,000 pounds per acre and disked into the soil to a depth of 3–4 inches, 2–4 weeks before planting. The cyanamide will also kill many weed seeds and upon decomposition, add nitrogen and calcium to the soil. Calcium cyanamide contains 20 percent nitrogen.

Terraclor 75 W (Pentachloronitrobenzene) applied at the rate of 20 pounds per acre as a spray is reported to control this disease. The spray is applied once in a 6–12 inch band just after transplanting. The 20 pounds are mixed in 50–100 gallons of water.

Black heart (heart rot) begins as tip burning of the young tender leaves in the heart. This condition usually occurs under conditions of high temperatures on fields with high nitrogen application or on acid soils with low available calcium content. Weekly sprays with calcium chloride at the rate of 5 pounds in 100 gallons of water, or calcium nitrate, 10 pounds in 100 gallons of water, and directed into the heart of the plants, gives satisfactory control of this condition.

The bacterial soft rot organism often causes a water-soaked, slimy, soft rot decay, beginning from the outer stalks. This disease is known to enter the plant through insect, disease, or mechanical damage. There is no known chemical treatment at present. The best preventive measure is in growing the crop in as rapid and clean a manner as possible.

The celery mosaic virus may infect the plants especially if the aphid population increases and such wild hosts as "honohono," infected with the virus, are found around the field. The symptoms of mosaic are stunting, mottling, crumpling of leaves, and unsightly browning on the petioles. The best control measure is to eradicate the infected wild host around the field and to keep the aphids controlled.

Celery is very susceptible to the rootknot nematodes. A crop heavily infested with nematodes will usually be stunted, and serious losses from heart rot may

result. The best control for the rootknot nematode is soil fumigation with EDB or DD two to three weeks before planting. Vapam is reported to give satisfactory control of rootknot nematodes when applied as a soil drench.

When applying an insecticide or fungicide, read the label carefully and follow the directions accurately. If a chemical is not registered for use with celery, do not apply it with this crop. If the instructions specify two pounds in 100 gallons of water per acre, do not use more. If the instructions specify 14 days from last spray to harvest do not spray later than the 14th day prior to expected harvest, or, on the other hand, do not harvest in less than 14 days from the time of the last spray application. This is necessary if you are to stay within the residue tolerance limit set by the Federal Government's Pure Food and Drug Act.

Harvesting

The celery will be ready for harvest 90 to 110 days after transplanting. The crop should not be left in the field too long after maturity because overmaturity will cause pithy and hollow stalks. The Pascal strains are more susceptible to this pithy and hollow stalk condition than the Utah strains.

In harvesting, the plants are cut with a knife just below the soil level. The plants are then roughly trimmed and hauled to a central place for washing, further trimming, cutting off of the tops, grading and packing in crates. Long exposure of the cut and trimmed celery to the sun and wind should be avoided. The packed crates should be placed in a storage house as soon as possible. Cold storage of celery should be at 32°F. with sufficient ventilation to keep the air free from excessive humidity.

Celery is a high yielder with an average output of 30,000 pounds an acre; a good yield of 40,000 pounds; and an exceptional yield of 70,000 pounds an acre.

Caution:

The harvesting and packing crew should be advised to wear clothing and gloves to cover all parts of the hands, arms, and legs because of skin blisters and other skin irritations caused by this crop to many persons.

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